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SALT LAKE CITY, UTAH

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SUMMARY OF ENGINEERING DESIGN
ADDITIONAL HEAP LEACH FACILITY
TINTIC PROJECT
FOR
NORTH LILY MINING COMPANY

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INTRODUCTION

North Lily Mining Company (NLMC) has constructed a gold and silver heap leach extraction facility at their Tintic Project located approximately four miles southwest of Eureka, Utah. The recovery process consists of a cyanide solution heap leach followed by a Merrill-Crowe extraction circuit for the secondary recovery of gold and silver. NLMC is now considering raising the existing heap from a height of 35 feet to 50 feet and constructing an additional heap leach pad immediately to the south of the existing pad. Ore would be placed on this new heap to a height of 50 feet also. Dames & Moore (D&M) has been authorized by NLMC to design the leach pad and surface diversion enhancements. Facility layouts have been determined in conjunction with NLMC.

This report summarizes the layout of the leach pad and related facilities and provides a summary of the engineering design for the new facilities.

The leach pad will consist of a 189,200 square foot pad, synthetically lined and contained within a perimeter berm. The pad will be immediately south and contiguous with the existing pad. It will be graded to drain to the northwestern corner of the pad and then into the collection channel which will be placed along the western perimeter of the new pad area. The tailings will be placed on the new pad to a uniform depth of approximately 50 feet. The tailings will come from the Mammoth Mine which consists of a coarser grade of tailings than has been utilized for existing dump facility.

Leach solutions will be collected by a network of subdrains on top of the leach pad liners and will be routed into collection ditches located inside the west perimeter berm. The solution in these ditches will flow by gravity to the southwest corner of the existing pad and into the existing collection channel, hence, to the pregnant and barren solution ponds with pipe connections to the recovery plant.

Storm runoff upslope from the site will be routed around the site by existing diversion ditches and existing topographic features. A small area of approximately 6.7 acres downslope of the existing diversion ditches will collect some surface runoff. This runoff will be diverted around the southeast corner of the new perimeter berm in a diversion ditch.

PROCESS DESCRIPTION

The process will be essentially similar to that utilized in the existing facility with the exception that the ore material will be aglomerated using Portlant cement in a new aglomeration plant which will be located within the plant site. This will result in higher percolation rates through the heap than has occurred in the existing heap ore. A description of the existing facilities can be found in a report prepared by Steffen, Robertson and Kirsten, Inc. for the initial project and dated November 1987*

SITE CONDITIONS

Site conditions are similar to that described in SRK's 1979 report and the area covered by the new heap leach pad is as described in their earlier report which covered this area. With respect to the climate, the area has a net evaporation loss of about 35 to 40 inches per year. The precipitation-frequencies summary for a 100-year return period shows that a 24-hour duration, 100-year storm would produce a total precipitation of 2.80 inches. This has been the design storm. In addition, a annual average snowmelt of .75 inches has been calculated. For design purposes, a conservative snowmelt of one inch was added to the 2.8 storm in calculating maximum storm runoff.

SUBSURFACE CONDITIONS

The 300 by 600 foot area for the new pad was explored to evaluate surface and shallow subsurface conditions. The proposed borrow area was similarly

*Report entitled: "Description of Leach Facilities for the Tintic Project, SRK report No. 13701/01, prepared for North Lily Mining Company by SRK, dated November 1987.

explored. A series of 30 test pits were excavated by NLMC and logged and sampled by D&M. These pits were excavated in September 1988 and were excavated to depths ranging from 5 to 9 feet below the present ground surface. The results of the backhoe pits indicate that the soils in the leach pad area and in the proposed borrow area are developed on alluvial outwash fans. The upper soils consist of a sandy clayey silt topsoil with major roots and organic manner in the upper eight inches. Underlying these soils are predominantly layers of clayey silt to silty clay but which are interbedded with occasional layers and lenses of silty fine to coarse sand and occasionally containing gravel. Some of the upper soils are partially cemented with calcite forming a relatively impermeable caliche layer. These caliche layers appear to be somewhat discontinuous as are all of the sand and granular layers. The soils are all generally firm with occasional layers of medium loose sand or gravel.

Ground water was not encountered in any of the borings and is reported to be several hundred feet below the site based on the existing water supply well for the plant.

In general, the alluvial deposits result in interbedded and intermixed layers of soil. Since most of the soil is silty and clayey in nature and because the granular soils are discontinuous, the vertical permeability of the overall layer is controlled in essence by the least permeable layers of silt and clay. Thus, although some higher permeability soils ($\pm 10^{-3}$ cm/sec) materials might occur below the foundation of the proposed pad area, the overall permeability will be controlled by the silts and clays (10^{-6} to 10^{-8} cm/sec).

The borrow area had similar soil conditions although they tended to be more finer-grained because they are further downstream in the alluvial fan. Of the 14 test pits dug in the proposed borrow area, an area containing the clayeyer soils, was selected for use as the borrow area. Soils in this area contained a preponderance of very clayey silts and silty clays with only an occasional sand and gravel lense. However, the contractor will have to be somewhat selective during construction to avoid bringing the more permeable granular soils into the pad area.

Based on our evaluation of the soils, they are considered satisfactory for the general pad fill and the secondary liner material.

Logs of the test pits are shown in Appendix A.

LABORATORY TESTS

To evaluate the strength and permeability characteristics of the foundation, borrow, and heap ore materials, a series of laboratory tests were performed on the soils. The testing consisted of moisture and density tests of undisturbed samples, compaction tests, gradation tests, and specific gravity. In addition, the strength of the foundation soils, the proposed clay pad liner materials, and the ore material was evaluated by a series of multi-stage consolidated, undrained triaxial compression tests (CU/PP). A description of test procedures and results are presented in Appendix A of this report.

FACILITIES LAYOUT AND DESIGN

The design of the heap leach pad was laid out in an effort to: 1) minimize the disturbed acreage, 2) minimize haul distances, 3) provide positive drainage around the facility, 4) minimize material quantities required for construction, i.e., balance cut-and-fill quantities insofar as possible, 5) provide flood protection for the berms for the facilities, 6) design liner systems to meet requirements of the State Water Board's regional plan for water resource and protection, and 7) meet all applicable state and federal guidelines for protection of the environment.

The heap leach pad is sized for processing up to 415,000 tons of tailings placed at a height of approximately 50 feet over an area of about 189,000 square feet. As mentioned previously, the leach pad is located immediately south of the existing heap pile and will be contiguous with it. It is within the NLMC lease boundary and outside of the highway rights-of-way. The maximum slope of the pad is approximately 5.03 percent, sloping just slightly north of due west. The subgrade base for the leach pad will be recompacted existing clayey material and compacted clayey fill with a surface graded to the slopes and elevations shown on the drawings. If the exposed excavated surface of the base pad is unsuitable material, a six inch layer of material having a permeability no greater than 10^{-6} cm/sec will be spread, graded and compacted prior to the placement of the detection system. Thus, the entire subgrade for the pad will consist of material meeting a 10^{-6} cm/sec permeability requirement and will be uniformly graded. Cuts and fills on the order of two to three feet will be required to achieve this final subgrade base.

A minimum two-foot high perimeter berm is provided around the east, south and west sides of the berm. The berm and exposed collection ditch along the west site will be covered with a 40-mil ultraviolet (U.V.) resistent PVC liner material.

STORM DIVERSION STRUCTURES

A small detention dam will be constructed abutting the eastern berm. The dam will be approximately one foot higher than the perimeter berm and will store storm water up to two feet deep. Additional storm water will be diverted around the southeastern corner of the new berm in a V-shaped ditch which will carry the design peak discharge of approximately nine cubic feet per second around the facility and discharge it onto the natural terrain.

LEAK DETECTION SYSTEM

Immediately overlying the graded subgrade a leak detection system will be constructed. It will consist of a series of one-inch diameter perforated pipes sloping at three percent which will be connected to a series of three inch solid manifold pipes which will carry the water to a series of sumps along the west side. The sumps will be monitored to detect any leakage into the detection system. The pipes will be overlain by four inches of clean granular sand and gravel which is in turn overlain by a geofabric to prevent clay liner material from infiltrating into the detection sand and gravel.

The geofabric will be overlain by a secondary liner consisting of a 12-inch layer of clay (with a permeability no greater than 10^{-8} cm/sec) compacted to 95 percent of the maximum as determined by the ASTM Designation 698-A, Method of Compaction.

The primary liner will consist of a 30-mil PVC synthetic liner (40-mil UV resistent PVC where exposed around the edges of the pile and in the collection ditch and berm areas).

COLLECTION SYSTEM

The leachate collection system will consist of a series of 1-1/2 inch or larger perforated pipes sloping at three percent and connected to a six-inch diameter manifold which will run along the northern edge of the new heap. These pipes will be placed at three feet center-to-center, or greater depending on the permeability characteristics of the protective cover material. A three-foot thick layer of protective ore will be placed over the pipes and primary liner to prevent damage to the liner. This protective cover will consist of the existing ore on the existing heap, which will be pushed over onto the new area and placed by hand over the pipes.

Because of the relatively low permeability of this proposed cover material, an alternative design may include screening the finer material out of the ore from the existing heap to increase its permeability characteristics. If this alternative is used, the spacing and size of the primary collection pipes will be increased to account for the higher permeability.

A secondary collection system is planned above the three-foot thick protective cover to insure proper collection of leachate and insure no excessive buildup of hydrostatic heads on the liner or within the ore pile itself. This secondary collection system will consist of three-inch diameter pipes placed 15 feet center-to-center. These will also be sloped at three percent and will be picked up in a manifold system and discharged into the collection channel along the west side.

The overall system is designed to handle a discharge rate of up to 400 gallons per minute of leachate on the pond as well as storm runoff.

PIEZOMETERS

A series of eight piezometers are planned to be installed within the interior of the pond to evaluate the hydraulic heads within the pond. These piezometers will consist of small diameter PVC pipe and will be able to measure buildup of heads within the interior portions as shown on the drawings.

HYDROLOGIC ASPECTS

Storm water falling on the heap leach pad and appurtenant facilities will be stored in the existing pregnant pond, barren pond and overflow pond. These ponds have been sized to contain the following volumes:

1. Normal working inventories;
2. One-hundred percent of a 24-hour heap draindown; and
3. Combined runoff from the pad and process area and direct precipitation on the ponds for a 100-year, 24-hour storm plus an average annual snowmelt.

It is anticipated that the maximum irrigation rate of 400 gpm will be used during heap leach operations. This corresponds to approximately 576,000 gallons per day. The total rainfall area within the plant, pad areas and peripheral area is approximately 699,000 square feet. A 24-hour storm of 2.8 inches plus a 1-inch snowmelt results in 3.8 inches of water over this area for a total of approximately 1,655,000 gallons. Thus, total draindown plus rain and snowmelt would result in approximately 2,231,000 gallons per day.

The area available for storage within the three ponds includes approximately 805,000 gallons in the pregnant pond, 876,000 gallons in the barren pond and 1,787,000 gallons in the overflow pond, resulting in a total of 3,468,000 gallons. This value does not include the two-foot freeboard which could provide additional storage. With the freeboard the total storage available is approximately 4,258,300 gallons.

During normal operating periods both the pregnant pond and barren pond contain leachate approximately three feet deep while the overflow pond contains no water. Thus, the volume available for storage during normal periods would be the total storage less the amount normally stored. This results in availability of approximately 3,788,700 gallons available using the freeboard storage and 2,998,200 gallons available without utilizing the freeboard space.

On this basis, the factor of safety for storage of the design storm is approximately 1.7 for the total area or 1.34 without using the freeboard storage. Thus, it can be seen that there is ample storage to handle the design storms.

SURFACE RUNOFF

The storm runoff from the small 6.7-acre area directly east of the two pads was estimated using the most conservative rationale technique. The curve resulted in a maximum storm runoff of approximately 9 cfs. The V-shaped diversion channel was designed to handle this flow with the water approximately one-foot deep and a slope of approximately 0.1 percent.

RECLAMATION

The "topsoil" stockpile areas have been identified and shown on the drawings. Some of the topsoil materials may be used to construct the berm so that they will be readily available for reclamation purposes.

Reclamation of the heap leach area will consist of neutralizing the heaps, filling in the ponds, and creating contoured, naturally revegetated areas which blend unobstrusively into the surrounding gentle slopes of the leach site as discussed in the SRK report.

APPENDIX A

FIELD INVESTIGATION AND LABORATORY TESTING

FIELD INVESTIGATION

The field investigation consisted of a site reconnaissance of the proposed leach pad area and borrow area and the logging of 30 test pits which had been recently excavated. All field operations were conducted and samples obtained by an experienced Dames & Moore geotechnical engineer. The test pit locations are shown on Plate 1 of the contract drawings. Logs of the test pits are shown on Plates A-1 through A-5 of this Appendix.

A laboratory testing program was performed on selected soil samples recovered from the test pits and from bulk surface samples taken of the existing and proposed ore materials to evaluate their index and engineering properties. The laboratory program included moisture content and dry density determinations, mechanical grain size distribution, specific gravity, compaction tests, and triaxial testing. Descriptions of the test procedures and results are presented in the following sections.

MOISTURE CONTENT AND DRY DENSITY DETERMINATIONS

Moisture content and dry density determinations were made for an undisturbed sample taken from the test pits. In addition, moisture content tests were performed on other samples. The results of these tests were used to characterize the density and moisture content of the undisturbed soil samples and to correlate with other samples. The test results are shown in Table A-1.

Table A-1

MOISTURE, DENSITY AND SPECIFIC GRAVITY TESTS

Sample	Percent Moisture Content	Dry Density (lbs/cu.ft.)
Mammoth Mine Ore (agglomerated - not leached)	14.1	-
Mammoth Mine Ore (agglomerated - leached)	14.0	-
Red Dump Ore (leached)	14.8	-
Test Pit 13 (at 3' depth)	16.0	101.1
Test Pit 27 (bulk sample)	8.7	-

GRAIN SIZE DISTRIBUTION

To aid in soil classification and permeability estimates, mechanical grain size distribution tests (gradation tests) were performed on selected samples in accordance with ASTM D-422, standard method for particle size analysis of soils. The results are presented on Plates A-6 through A-9.

SPECIFIC GRAVITY TESTS

Specific gravity tests were performed on bulk samples of the potential ore materials to determine ore density and to aid in determining suitability as fill cover material. The results are shown in Table A-1.

COMPACTION TESTS

Compaction tests were conducted to determine the moisture density relationship of the site soils. The test results served as the basis for evaluating soil compaction for compliance with construction specifications.

The compaction tests were performed in accordance with the ASTM D-698, Method A. The test results are presented on Plates A-10 through A-13. Compaction Test Data.

TRIAXIAL COMPRESSSION TESTS

A series of five multi-staged consolidated/undrained triaxial compression tests with pore pressure measurements were performed on representative samples of the ore materials, subgrade materials, and proposed secondary clay liner material. These tests were conducted in three phases: saturation, consoli-idation, and shear. During the three phases, the effective stresses were monitored by pore pressures and total stress measurement. Saturation of the samples was achieved by applying increments of cell pressure until adequate pore pressure response was obtained. A ratio of the pore pressure increment to the confining pressure increment in excess of about 0.95 is considered an acceptable degree of saturation. Samples were allowed to consolidate under a selected isotropic confining pressure. After consolidation, the samples were loaded axially to failure without allowing further drainage, at a rate slow enough to allow equalization of pore pressures.

The results of the triaxial compression tests that were performed for this investigation are summarized in Table A-2.

TABLE A-2

SUMMARY OF TRIAXIAL TEST RESULTS

Sample	Depth (ft.)	Classification	Initial Dry Density (pcf)	Initial Moisture Content (%)	$\bar{\phi}$ Effective Friction Angle (degrees)	$\bar{c}$ Effective Cohesion (psf)
TP-27	Bulk	ML	103.6	16.3	44	70
TP-13	3	ML-CL	101.1	16.0	30	430
Red Dump Leached Material(1)	Bulk	SM	90.4	17.0	31	0
Mammoth Dump Leached Material(2)	Bulk	SM	92.9	15.5	32	0
Mammoth Dump Non-Leached Material(3)	Bulk	SM	94.6	15.0	31	0

(1)Material taken from existing heap, compacted to 80 percent of the maximum density as determined by the ASTM 698-A Method of Compaction.

(2)Mammoth Dump material taken from column leach test, compacted to 80 percent of the maximum density as determined by the ASTM 698-A Method of Compaction.

(3)Mammoth Dump material taken from stockpile, compacted to 80 percent of the maximum density as determined by the ASTM 698-A Method of Compaction.

TEST PIT 1

DEPTH IN FEET: 0, 2, 4, 6

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY
GRADES WITH A 8 INCH BROWN AND WHITE SILTY SAND AND GRAVEL LAYER – LOOSE, DRY

TEST PIT COMPLETED AT 4.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 2

DEPTH IN FEET: 0, 2, 4

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE, SLIGHTLY MOIST

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

ML — BROWN SILT WITH SOME FINE SAND - MEDIUM DENSE, SLIGHTLY MOIST

TEST PIT COMPLETED AT 4.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 3

DEPTH IN FEET: 0, 2, 4

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

ML — BROWN SILT WITH SOME FINE SAND - MEDIUM DENSE, SLIGHTLY MOIST

TEST PIT COMPLETED AT 4.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 4

DEPTH IN FEET: 0, 2, 4, 6

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

ML — LIGHT BROWN CLAYEY FINE SAND - MEDIUM DENSE, MOIST

TEST PIT COMPLETED AT 5.8 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 5

DEPTH IN FEET: 0, 2, 4

GM — BROWN SILTY FINE TO COARSE SAND AND GRAVEL WITH ROOTS - LOOSE, DRY

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

TEST COMPLETED AT 4.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 6

DEPTH IN FEET: 0, 2, 4

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

SP-SM — BROWN SILTY FINE TO COARSE SAND - LOOSE TO MEDIUM DENSE, DRY

TEST PIT COMPLETED AT 4.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 7

DEPTH IN FEET: 0, 2, 4, 6

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

CL — LIGHT BROWN SILTY CLAY - STIFF, DRY

ML — BROWN CLAYEY FINE SAND - MEDIUM DENSE, MOIST

TEST PIT COMPLETED AT 4.3 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

KEY

■ DEPTH AT WHICH DISTURBED SAMPLE WAS EXTRACTED

BULK SAMPLE

LOG OF TEST PITS

REVISIONS BY ___ DATE ___ BY ___ DATE ___ PLATE ___ OF ___

FILE 19245-001 CHECKED BY ___ DATE ___

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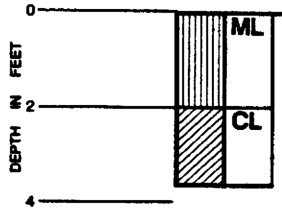
PLATE A-1

TEST PIT 8

ELEVATION



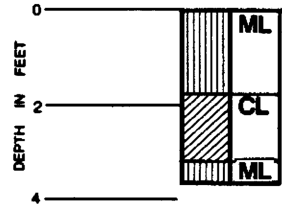
BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

TEST PIT COMPLETED AT 3.8 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 9

ELEVATION

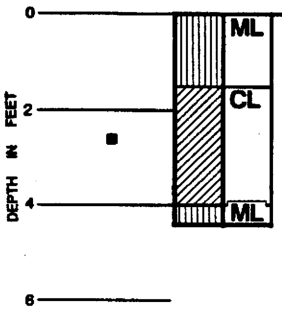


BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

BROWN CLAYEY FINE SAND - MEDIUM DENSE, MOIST
TEST PIT COMPLETED AT 3.8 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 10

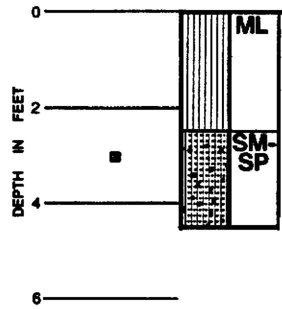


BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

BROWN CLAYEY FINE SAND - MEDIUM DENSE, MOIST
TEST PIT COMPLETED AT 4.3 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 11



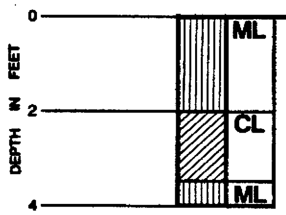
BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

BROWN SILTY FINE TO COARSE SAND MEDIUM DENSE, DRY

GRADES MOIST

TEST PIT COMPLETED AT 4.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 12

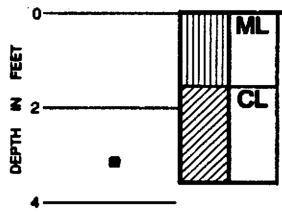


BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

LIGHT BROWN SILTY CLAYEY FINE SAND - MOIST
TEST PIT COMPLETED AT 4.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 13

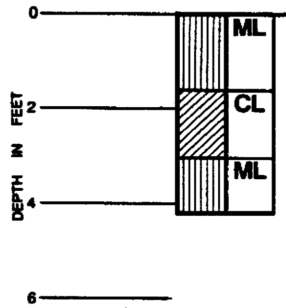


BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

TEST PIT COMPLETED AT 3.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 14



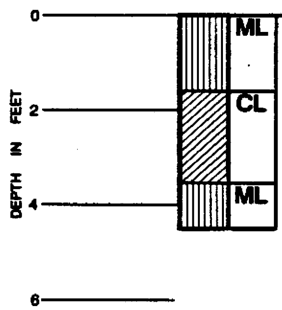
BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

BROWN SILTY FINE SAND WITH CLAY - DENSE, DRY

TEST PIT COMPLETED AT 4.2 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 15



BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY

LIGHT BROWN SILTY CLAY - STIFF, DRY

LIGHT BROWN CLAYEY FINE SAND - MEDIUM DENSE, MOIST

TEST PIT COMPLETED AT 4.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

LOG OF TEST PITS

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TEST PIT 16

DEPTH IN FEET

0–1.5	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
1.5–3	CL	LIGHT BROWN SILTY CLAY - STIFF, DRY
3–4.2	ML	LIGHT BROWN CLAYEY FINE SAND

TEST PIT COMPLETED AT 4.2 FEET
ON 8-2-89
GROUND WATER WAS NOT ENCOUNTERED

TEST PIT 17

DEPTH IN FEET

0–2	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY GRADES MEDIUM DENSE AND SLIGHTLY MOIST
2–6.8	CL-ML	LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY GRADES WHITISH WITH SOME FINE SAND

TEST PIT COMPLETED AT 6.8 FEET
ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 18

DEPTH IN FEET

0–1.6	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY GRADES MEDIUM DENSE AND SLIGHTLY MOIST
1.6–8.5	CL-ML	LIGHT BROWN SILTY CLAY-CLAYEY SILT WITH OCCASIONAL GRAVEL - MEDIUM STIFF, DRY GRADES WITH 6 INCH LAYER OF GRAVELY CLAY

TEST PIT COMPLETED AT 8.5 FEET
ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 19

DEPTH IN FEET

0–1	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY GRADES MEDIUM DENSE AND SLIGHTLY MOIST
1–5	SP-SM	BROWN TO GRAY SILTY FINE TO COARSE SAND WITH GRAVEL - MEDIUM DENSE, DRY
5–7	CL-ML	LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

TEST PIT COMPLETED AT 7.0 FEET
ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 20

DEPTH IN FEET

0–1.2	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY GRADES MEDIUM DENSE AND SLIGHTLY MOIST
1.2–7	CL-ML	LIGHT BROWN SILTY CLAY - CLAYEY SILT WITH OCCASIONAL GRAVEL - MEDIUM STIFF, DRY

TEST PIT COMPLETED AT 7.0 FEET
ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 21

DEPTH IN FEET

0–1	ML	BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY GRADES MEDIUM DENSE AND SLIGHTLY MOIST
1–7	ML-CL	LIGHT BROWN SILTY CLAY - CLAYEY SILT WITH OCCASIONAL GRAVEL - MEDIUM DENSE, DRY

TEST PIT COMPLETED AT 7.0 FEET
ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

LOG OF TEST PITS

Dames & Moore

TEST PIT 22

DEPTH IN FEET (0–8)

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

ML-CL — LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

GRADES WITH 6 INCH LAYERS OF BROWN TO GRAY SILTY FINE TO COARSE SAND

TEST PIT COMPLETED AT 7.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 23

DEPTH IN FEET (0–10)

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

CL-ML — LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

SP-SM — BROWN GRAY SILTY FINE TO COARSE SAND MEDIUM DENSE, DRY

CL-ML — LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

TEST PIT COMPLETED AT 8.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 24

DEPTH IN FEET (0–6)

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

CL-ML — LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

GRADES WHITISH

TEST PIT COMPLETED AT 6.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 25

DEPTH IN FEET (0–8)

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

CL-ML — LIGHT BROWN SILTY CLAY - CLAYEY SILT WITH FINE SAND AND OCCASIONAL GRAVEL - LOOSE TO MEDIUM DENSE, SLIGHTLY MOIST

TEST PIT COMPLETED AT 6.5 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

TEST PIT 26

DEPTH IN FEET (0–8)

ML — BROWN TO DARK BROWN SILT WITH FINE TO MEDIUM SAND AND ROOTS - LOOSE, DRY
GRADES MEDIUM DENSE AND SLIGHTLY MOIST

CL-ML — LIGHT BROWN SILTY CLAY - CLAYEY SILT - MEDIUM STIFF, DRY

GRADES WITH 6 INCH LAYERS OF GRAY BROWN FINE TO COARSE SAND

TEST PIT COMPLETED AT 8.0 FEET ON 8-2-89.
GROUND WATER WAS NOT ENCOUNTERED.

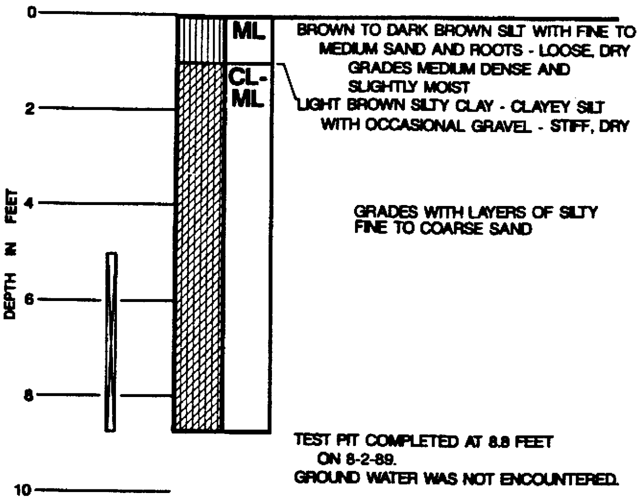
LOG OF TEST PITS

Dames & Moore

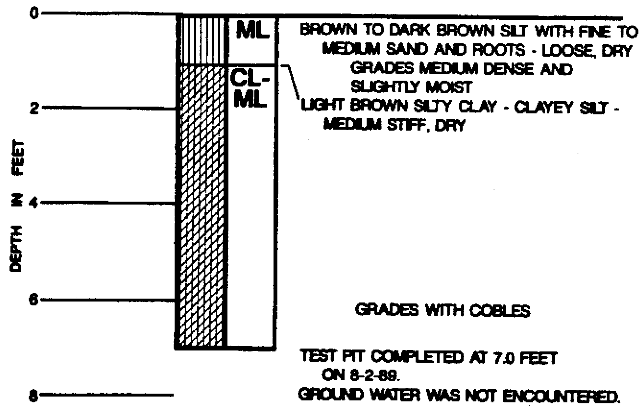
PLATE A-4

REVISIONS BY DATE BY DATE PLATE OF
FILE 19245-001 CHECKED BY DATE

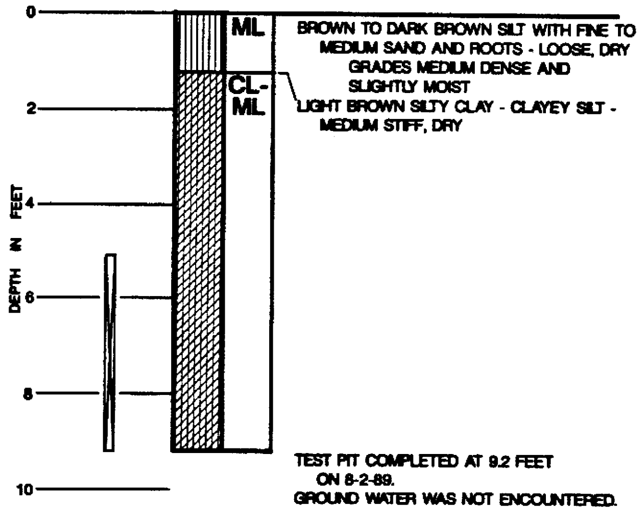
TEST PIT 27



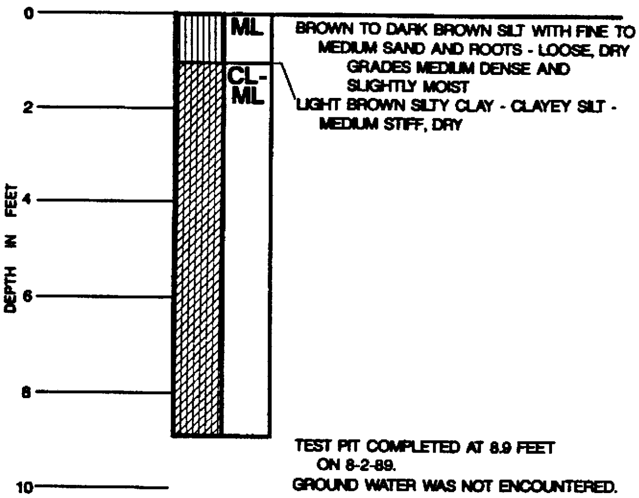
TEST PIT 28



TEST PIT 30



TEST PIT 29



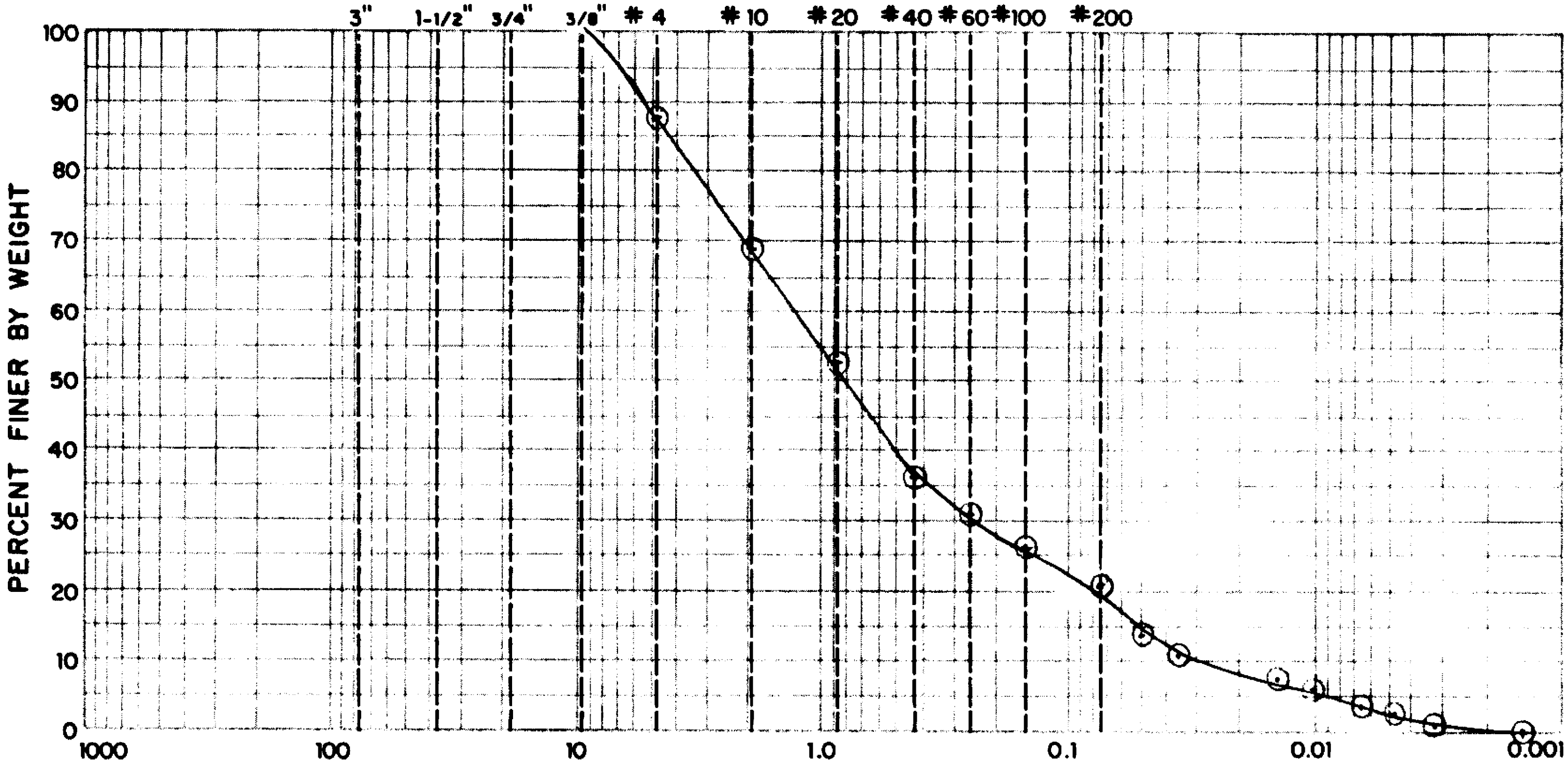
NOTE:
TEST PITS 31 THROUGH 35 LOGGED BY OTHERS.

LOG OF TEST PITS

Dames & Moore

FI 19245-001 BY 8/ /89 VERIFIED B TE

U.S. STANDARD SIEVE SIZE



GRAIN SIZE IN MILLIMETERS

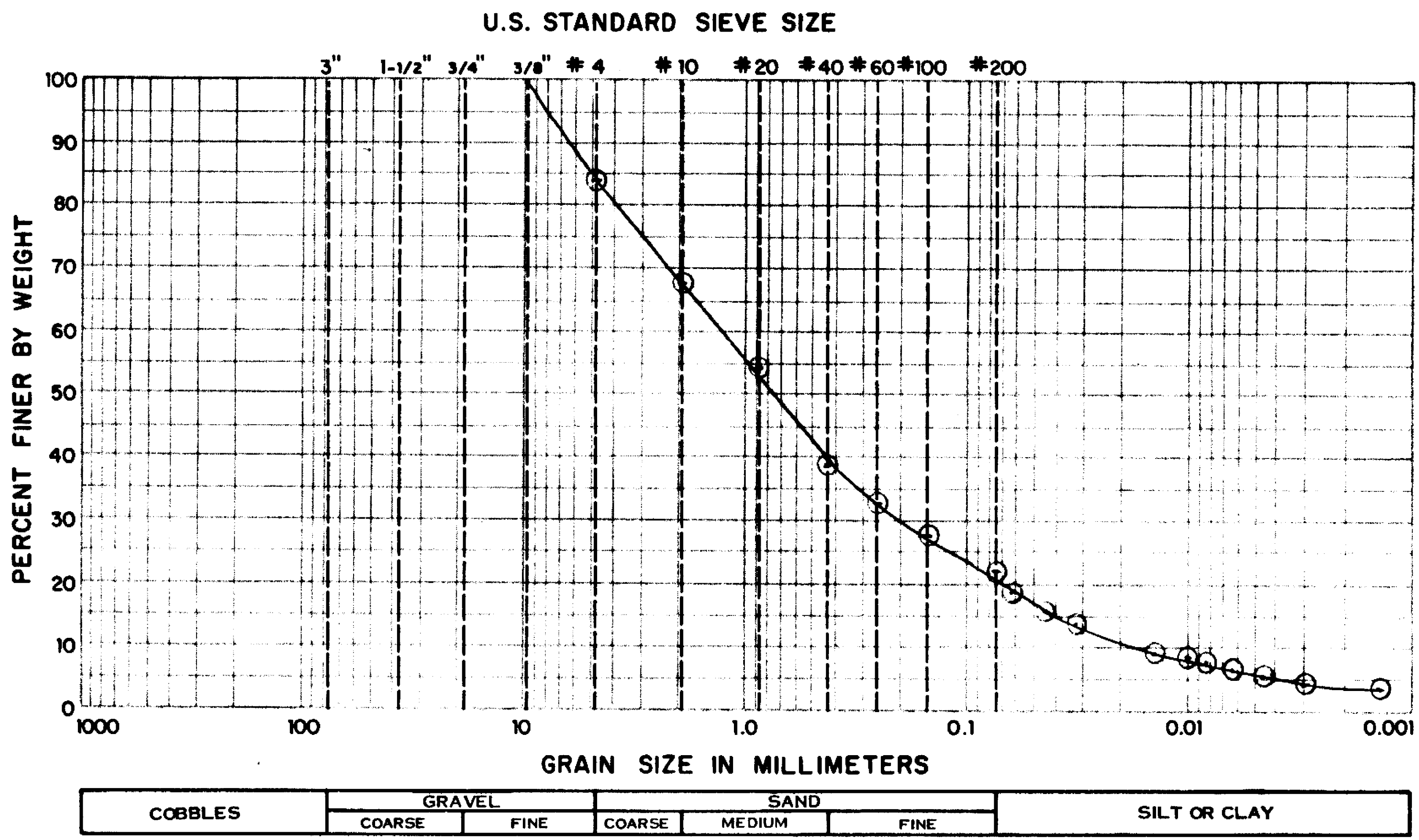
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	SYMBOL
MAMMOTH DUMP AGGLOM., NOT	BULK	SILTY FINE TO COARSE SAND WITH GRAVEL	SM

LEACHED
(-3/8" MATERIAL)

Dames & Moore

PLATE A-6

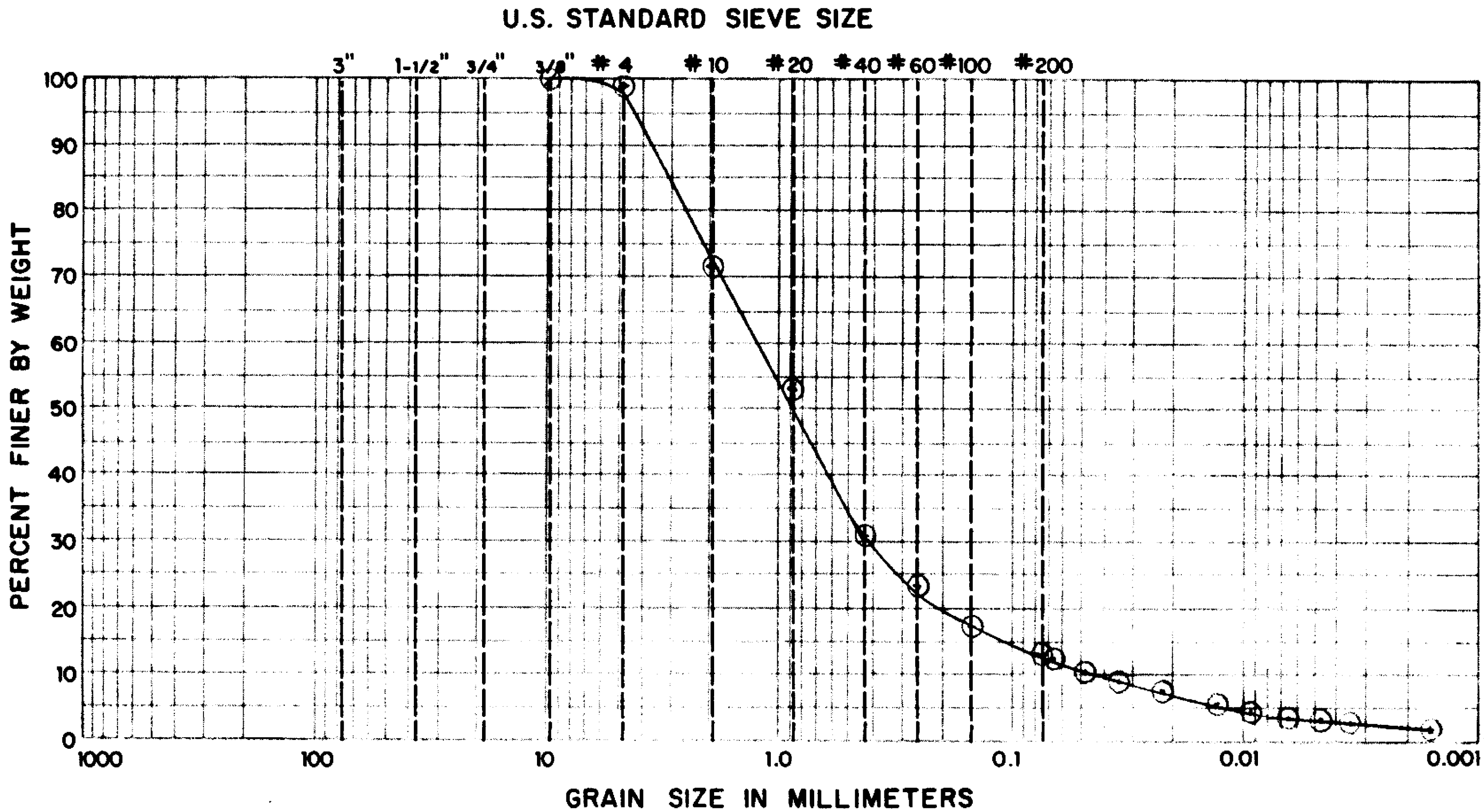


LOCATION	DEPTH	CLASSIFICATION	SYMBOL
MAMMOTH DUMP AGGLOM., LEACHED (-3/8" MAT'L)	BULK	SILTY FINE TO MEDIUM SAND WITH GRAVEL	SM

Dames & Moore

PLATE A-7

FILE 19245-001 BY EGL DATE 8/9/88



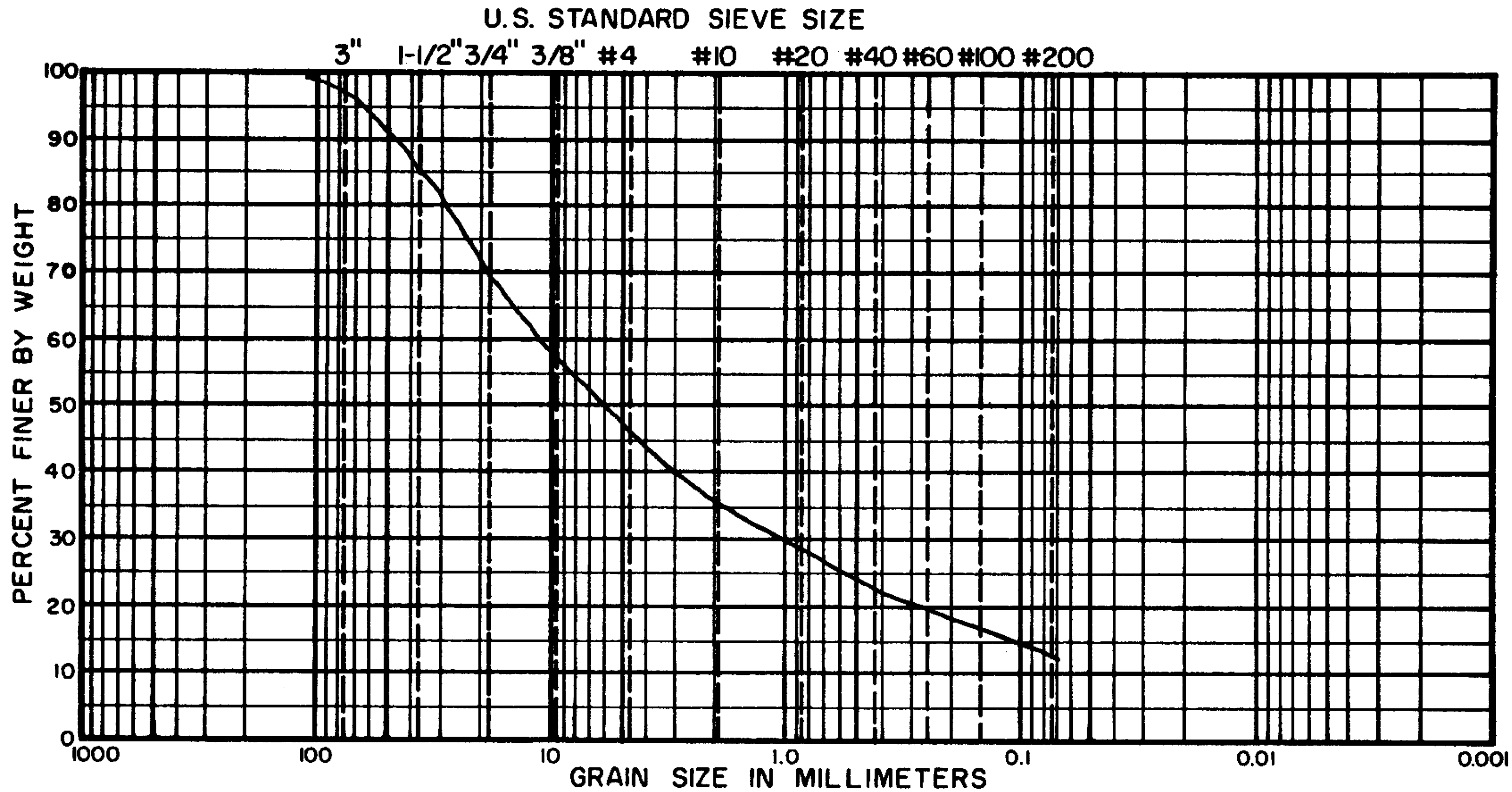
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION	SYMBOL
RED DUMP ORE LEACHED	BULK	SILTY FINE TO COARSE SAND	SM

(-3/8" MATERIAL)

Dames & Moore

CHECKED BY ______ FILE ______ BY ______ DATE ______



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LOCATION	DEPTH	CLASSIFICATION
MAMMOTH DUMP TOTAL SAMPLE	BULK	SILTY FINE TO COARSE SAND AND GRAVEL

DAMES & MOORE

PLATE A-9

SAMPLE NO. A_1 & A_2 DEPTH — ELEVATION

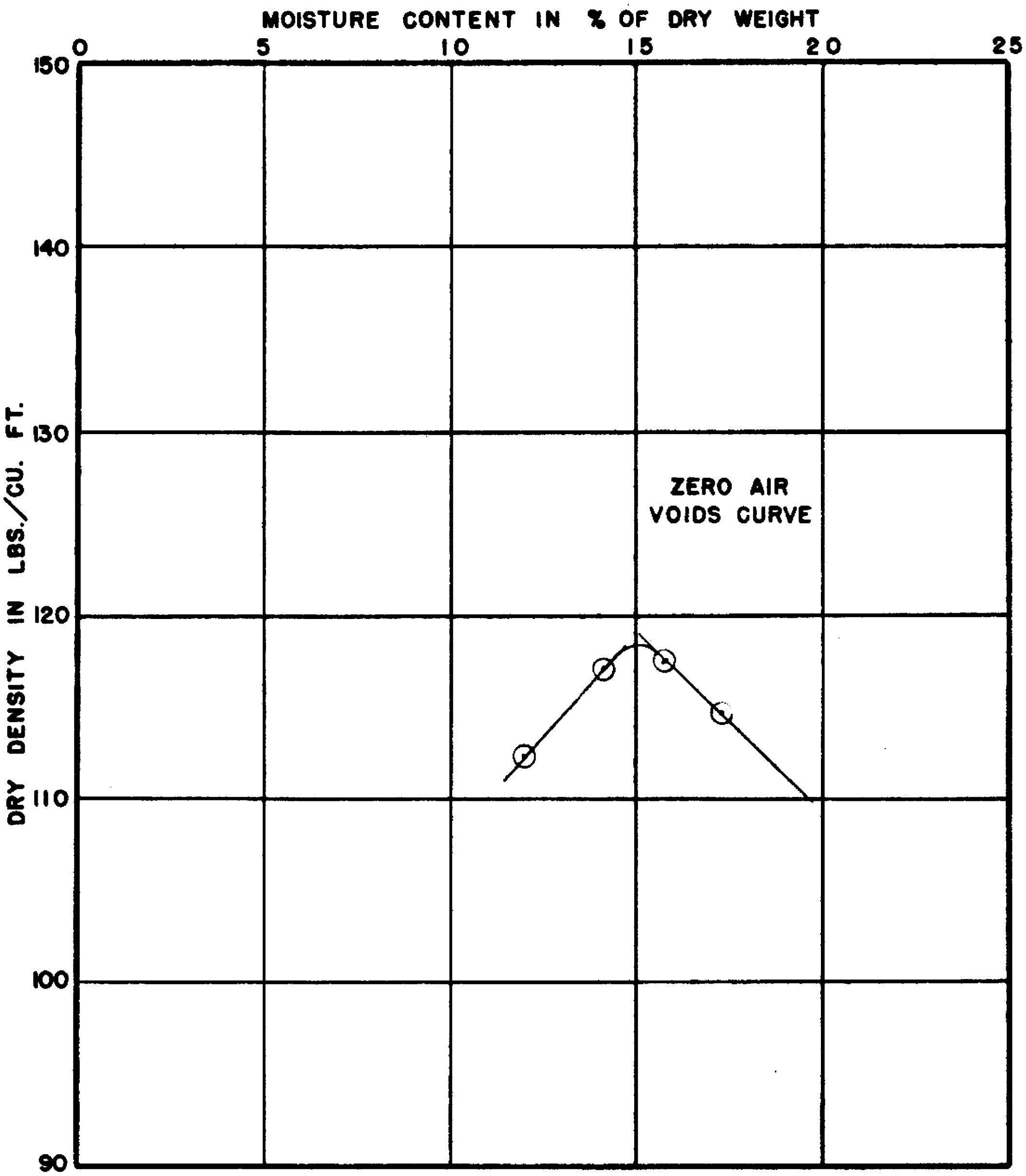
SOIL MAMMOTH DUMP - MINE TAILS

LOCATION AGGLOMERATED - NOT LEACHED

OPTIMUM MOISTURE CONTENT 15 %

MAXIMUM DRY DENSITY 118.2

METHOD OF COMPACTION D 698 METHOD A



COMPACTION TEST DATA

DAMES & MOORE

[redacted]E N. Lily Mine Co.

[redacted]29[redacted]0[redacted]

[redacted]VISI[redacted] BY DATE

RE[redacted]2 BY DATE

[redacted]AWN BY[redacted]EE[redacted] DA[redacted]/3/[redacted]

CHECKED BY DATE

SAMPLE NO. B_1 & B_2 DEPTH ______ ELEVATION ______

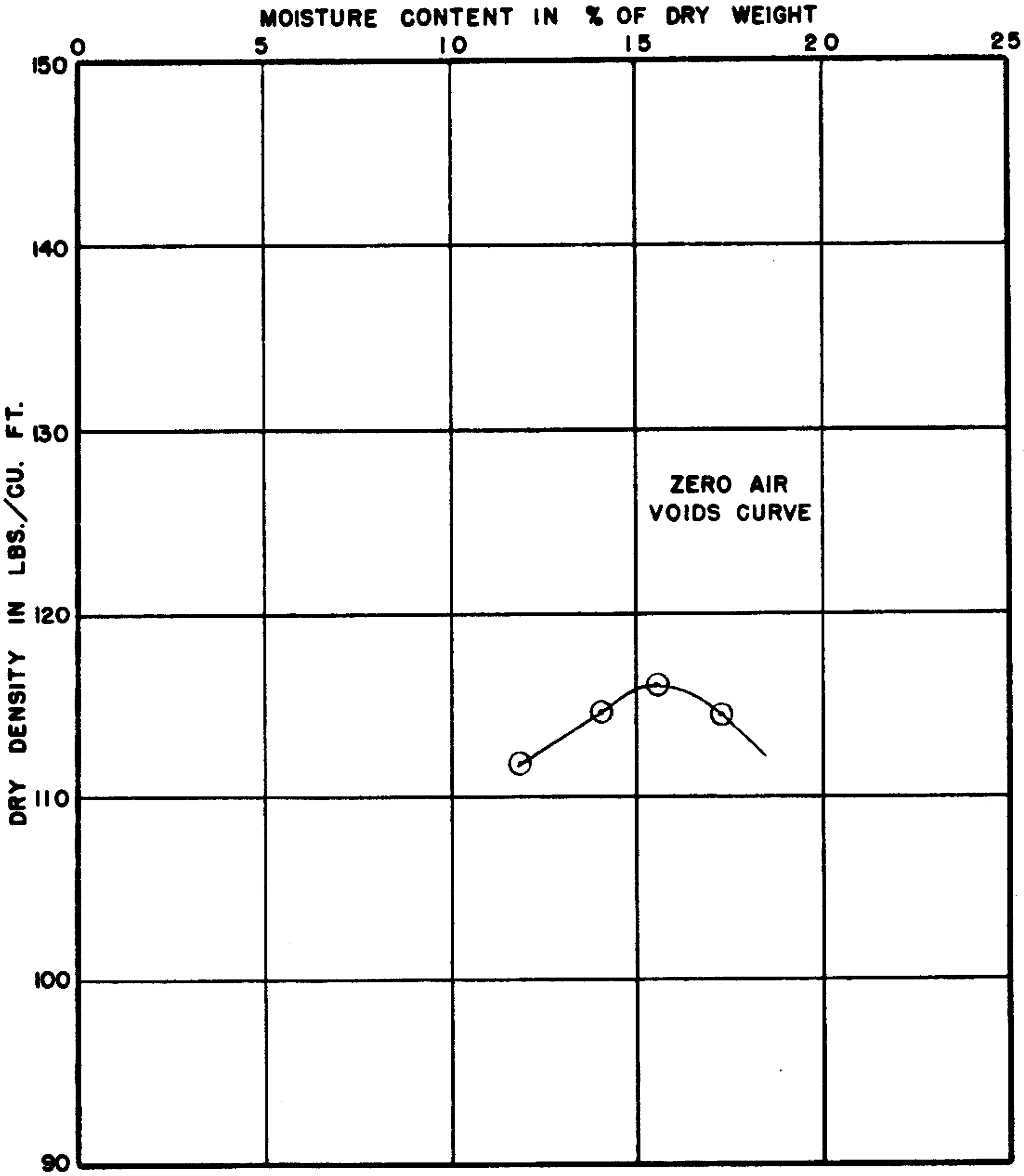
SOIL MAMMOTH MATERIAL COLUMN LEACHED MAT'L

LOCATION EUREKA

OPTIMUM MOISTURE CONTENT 15.5 %

MAXIMUM DRY DENSITY 116.1 pcf

METHOD OF COMPACTION D698 A



COMPACTION TEST DATA

DAMES & MOORE

PLATE A-11

956.1 (REV. 4-57)

N. Lily Mining Co.

CHECKED BY ______ DATE ______

BY ______ DATE ______

BY ______ DATE ______

SAMPLE NO. $C_1 + C_2$ DEPTH ______ ELEVATION ______

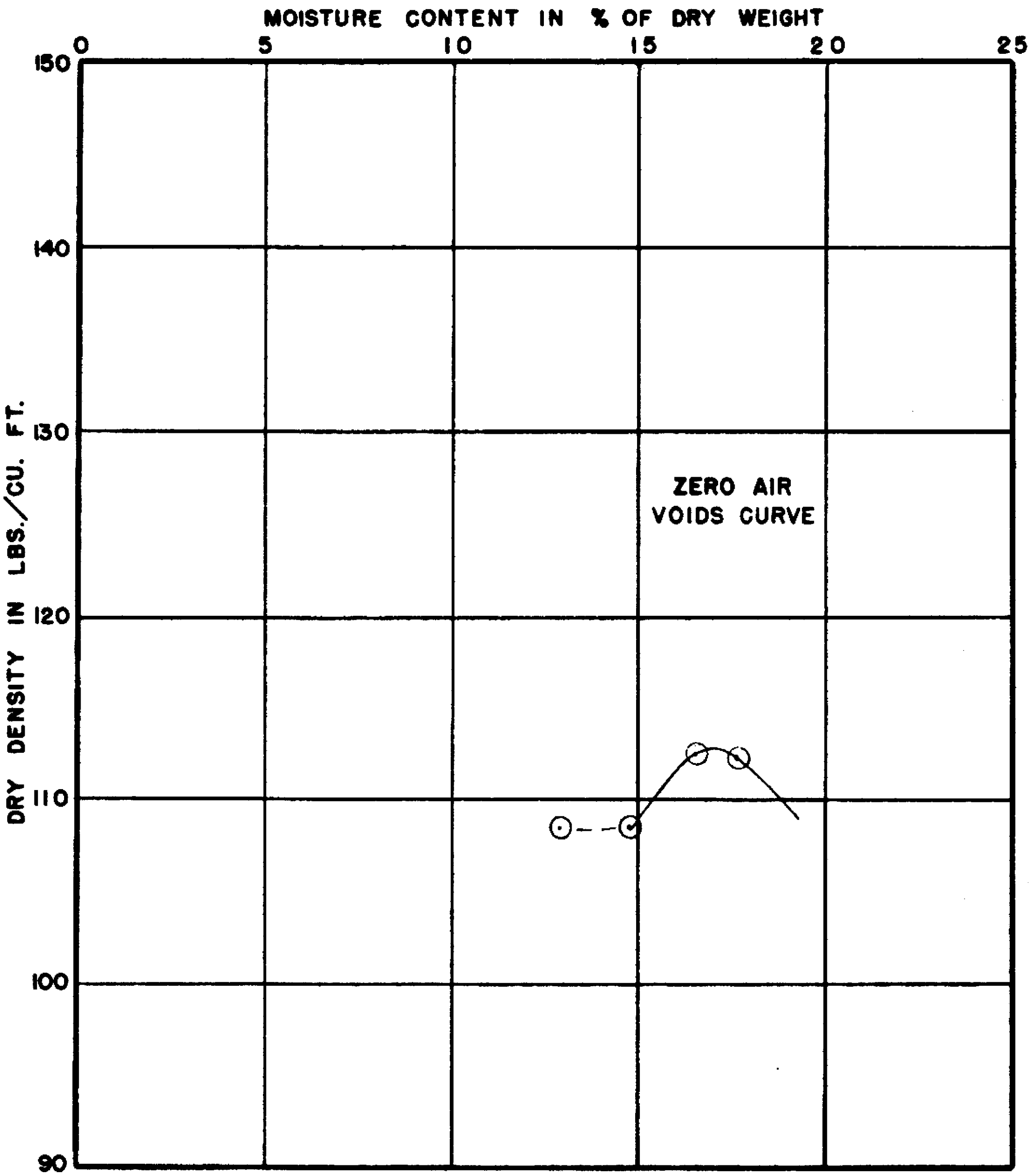
SOIL LEACHED RED DUMP MATERIAL

LOCATION NEAR EUREKA UT.

OPTIMUM MOISTURE CONTENT 17.0%

MAXIMUM DRY DENSITY 113 pcf

METHOD OF COMPACTION D698 A



COMPACTION TEST DATA

DAMES & MOORE

DRAWN BY ______ DATE ______
CHECKED BY ______ DATE ______
REVISION 2 BY ______ DATE ______
REVISION BY ______ DATE ______
N. LILY MINING CO.

956.1 (REV. 4-57)

PLATE A-12

[redacted] WN [redacted] DA [redacted]
CHECKED BY________ DATE________

RE[redacted] 2
BY________
DATE________

[redacted]VISION
BY________
DATE________

[redacted]

SAMPLE NO. TP-27 DEPTH BULK ELEVATION________

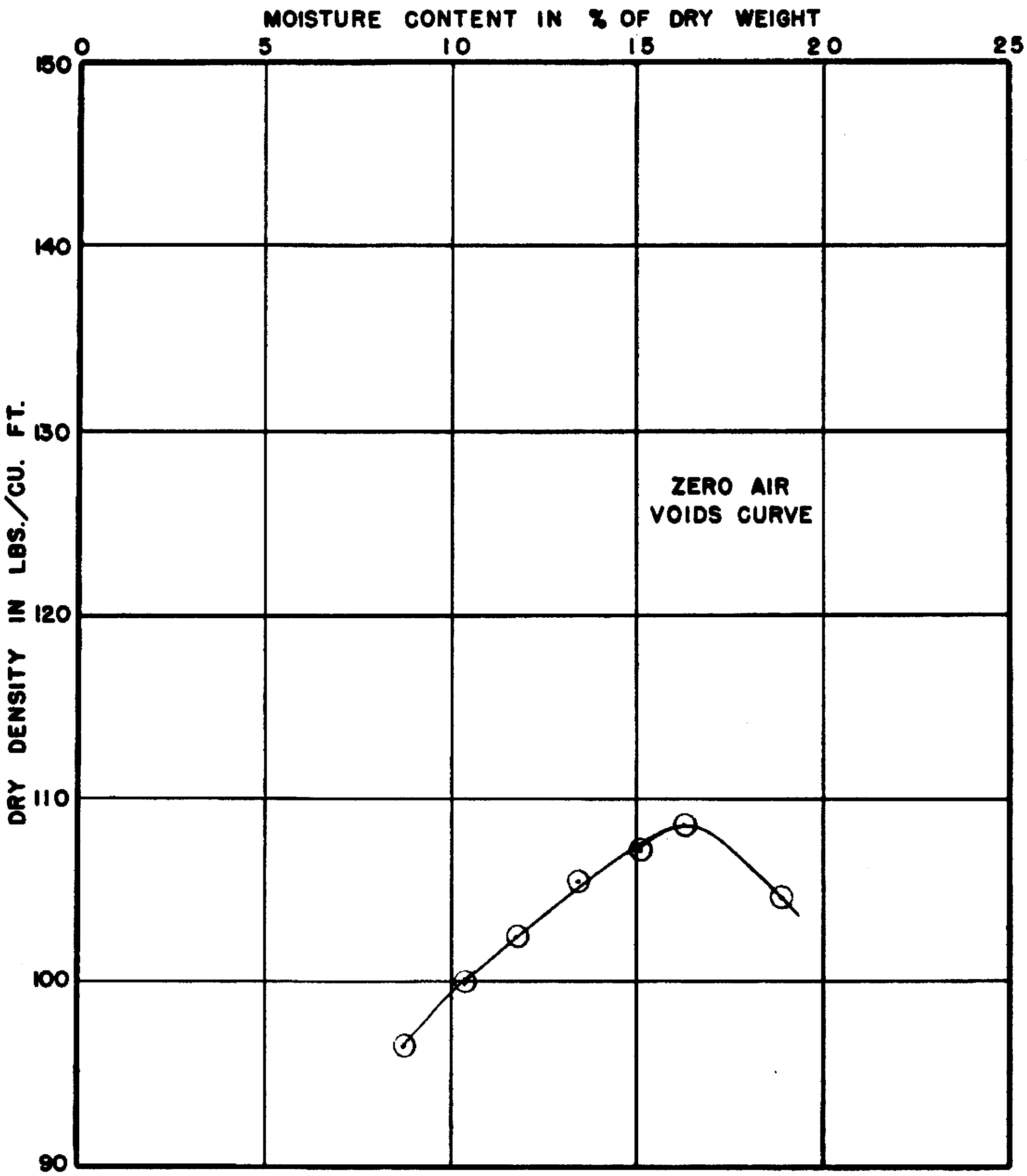
SOIL SANDY CLAYEY SILT

LOCATION EUREKA

OPTIMUM MOISTURE CONTENT 16.3%

MAXIMUM DRY DENSITY 108.6

METHOD OF COMPACTION D 698 A



COMPACTION TEST DATA

DAMES & MOORE